Letters to the Editor

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- Include no more than 500 words of text, three authors, and five references
- Type with double-spacing
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Aortic annuloplasty and valve-sparing root replacement: Details of the primary suture line

To the Editor:

I greatly appreciate Dr David's poignant editorial comments[1] regarding graft sizing and tailoring during reimplantation of the aortic valve. There is no question that the anatomic components of the aortic valve amid a root aneurysm are abnormal. My primary hypothesis is that if we can restore proportional geometry to as close to normal as possible, we will be left with a more durable reimplanted valve—a concept that is also relevant to mitral valve repair. Dr David raised several concerns, notably the importance of (1) supporting the subcommissural triangles, (2) supporting the aortic annulus to prevent dilatation, and (3) restoring cusp coaptation height relative to the annular plane at the nadirs. With my technique, the subcusp suture line follows the coronet shape as it passes through the graft, but below the commissures there is a redundant triangular area of graft that juxtaposes the subcommissural triangle from one nadir to the next. With David's technique, the base of this triangle is where the primary suture line is placed. In my technique this area is similarly covered by overlying graft, but the affixing sutures sit higher and higher on the graft as the commissure is approached—this can often be 12 to 25 mm above the plane of the nadirs and above the edge of the graft directly below the commissure. The depth of dissection to achieve this graft position is the same for both techniques. The proximal end of the graft is necked down at the very base (positioned in the same plane as David's technique), but it is secured via non–pledget-supported subcusp mattress sutures that are passed through the annulus for greater structural support rather than through the fibrous subcommissural triangle—an area that is quite thin near the membranous septum. There is no need to have the subcommissural triangle actually sutured to the graft at the level of the nadirs because this fibrous triangle will quickly scar to the adjacent graft, affixing its diameter indefinitely after reimplantation. The area in question is a potential space that is easily dissected and is not normally supported by anything but the adjacent cardiac chambers. Therefore, the graft does circumferentially support both the subcommissural fibrous triangles and the annulus, and unlike the remodeling technique, a truly complete aortic annuloplasty is achieved. To date there has been no sign of any dilatation at the annular level or below.

I agree that cusp coaptation height is extremely important, and this is the reason why aortic annuloplasty is so important in a pathologic root. If the annulus and commissural resuspensions are not correctly reconstructed, there will be prolapse of one or more cusps below the optimal coaptation zone—5 to 6 mm above the annular plane, as Dr David explains. The impetus for developing my modifications was both to optimize the coaptation point (prevent prolapse) *and* to reduce the stress on the cusps by restoring a higher percentage of laminar flow through the valve during late systole (accommodate the cusps with optimally sized sinuses to prolong durability). Using M-mode echocardiography to evaluate leaflet opening and closing characteristics,[2] magnetic resonance–based magnitude masked flow images to evaluate anatomic detail, and magnetic resonance–based phase contrast flow images to evaluate flow dynamics,[3] we have been carefully studying all of the issues raised above to prove that these goals are being met. For example, Figure 1 shows still-frames from dynamic images extracted from phase contrast magnetic resonance studies all timed to peak opening at late systole. Note that in using this modified David technique, the reimplanted aortic valve of a Marfan patient has an effective orifice with flow dynamics that have been restored to normal in stark contrast to its preoperative state. More comprehensive quantitative and qualitative imaging studies are ongoing.

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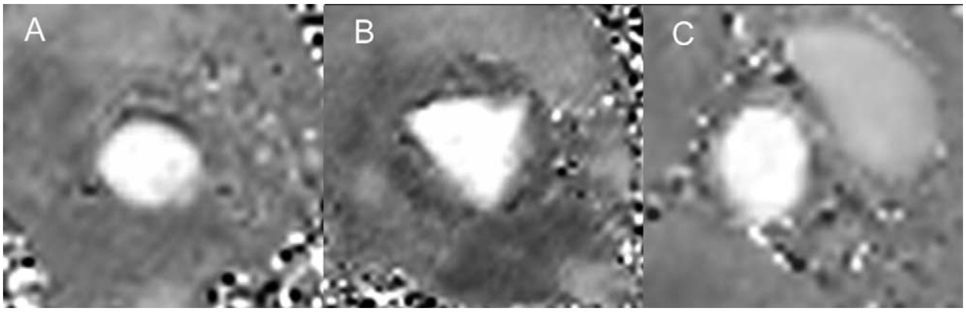

Figure 1. Dynamic magnetic resonance-based phase contrast flow images taken at a level 2 to 3 mm above the plane of the nadirs of the cusp hinge points (ie, the valvular portion of the root) frozen at peak opening (late systole) in a normal volunteer (A), preoperative Marfan patient (B), and postoperative Marfan patient (C). Note that *white areas* represent blood flowing perpendicular to the plane of the image out toward the viewer or laminar, antegrade flow.

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References

1. David TE. Sizing and tailoring the Dacron graft for reimplantation of the aortic valve. *J Thorac Cardiovasc Surg*. 2005;130:243-4.
2. Aybek T, Sotiriou M, Wohleke T, Miskovic A, Simon A, Doss M, Dogan S, Wimmer-Greinecker G, Moritz A. Valve opening and closing dynamics after different aortic valve-sparing operations. *J Heart Valve Dis*. 2005; 14:114-20.
3. Kvitting JP, Ebbers T, Wigstrom L, Engvall J, Olin CL, Bolger AF. Flow patterns in the aortic root and the aorta studied with time-resolved, 3-dimensional, phase-contrast magnetic resonance imaging: implications for aortic valve-sparing surgery. *J Thorac Cardiovasc Surg*. 2004;127:1602-7.

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Surgical management of pulmonary embolism

To the Editor:

We read with interest the study reported by Leacche and associates[1] regarding their surgical experience in treating massive pulmonary embolism. We would like to congratulate the authors for their excellent outcomes in this relatively large number of patients and for the encouraging results that they achieved with this patient population. The authors used a technique of cardiopulmonary bypass and temporary flow reductions for visualization of the pulmonary arterial tree for clot removal.

In the past 3 months we have treated 3 patients with massive pulmonary embolism by surgical embolectomy. The first was a 45-year-old patient who had rib fractures and subsequently deep vein thrombosis. The patient was admitted with shortness of breath and chest pain and had a cardiac arrest. After initial successful resuscitation, a pulmonary angiogram confirmed bilateral massive emboli in the pulmonary tree. A second 65-year-old patient had subdural and intracerebral hemorrhage from a fall down a stair while in an alcoholic stupor. This patient needed increasing inotropic and ventilatory support to maintain his oxygenation, and a subsequent computed tomographic scan of the chest revealed bilateral massive pulmonary emboli. A third 47-year-old patient with significant peripheral vascular disease was admitted with chest pain and shortness of breath. Massive pulmonary emboli were confirmed by computed tomographic scan. The first patient did not respond to thrombolysis, whereas the other 2 patients had documented right ventricular strain and dysfunction with paradoxical movement of the ventricular septum.

We performed surgical embolectomy under cardiopulmonary bypass with systemic cooling to 34°C with asystole induced by antegrade cold blood cardioplegia. This allowed excellent visualization of the branches of the pulmonary artery in a bloodless field. In the first 2 cases fresh embolus was easily extracted with a short crossclamp time (39 and 28 minutes) and cardiopulmonary bypass time (75 and 63 minutes). The third patient was found to have adherent organized thrombus. This was extremely difficult to remove but was extracted successfully due to good visualization with cardioplegic arrest (bypass time 107 minutes; crossclamp time 70 minutes).

We believe that cardioplegic arrest greatly facilitates the operation and obviates the need to reduce the flow to improve visualization. In a simple case of fresh thrombus, the time required is short and therefore is unlikely to have any detrimental effect on cardiac or immunologic function. In complicated cases, such as our third case with late presentation, the disadvantage of the longer ischemic time is easily balanced by the ability to successfully remove adherent clot without injury to the pulmonary artery.

Again, we would like to congratulate the authors for their exciting and encouraging results.

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Reference

1. Leacche M, Unic D, Goldhaber SZ, Rawn JD, Aranki SF, Couper GS, et al. Modern surgical treatment of massive pulmonary embolism: results in 47 consecutive patients after rapid diagnosis and aggressive surgical approach. *J Thorac Cardiovasc Surg*. 2005;129: 1018-23.

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